Una grammatica G
si dice <u>ambigua</u>

se e solo se

esiste almeno una
stringa in L_G che
ammette più di un
albero di derivazione

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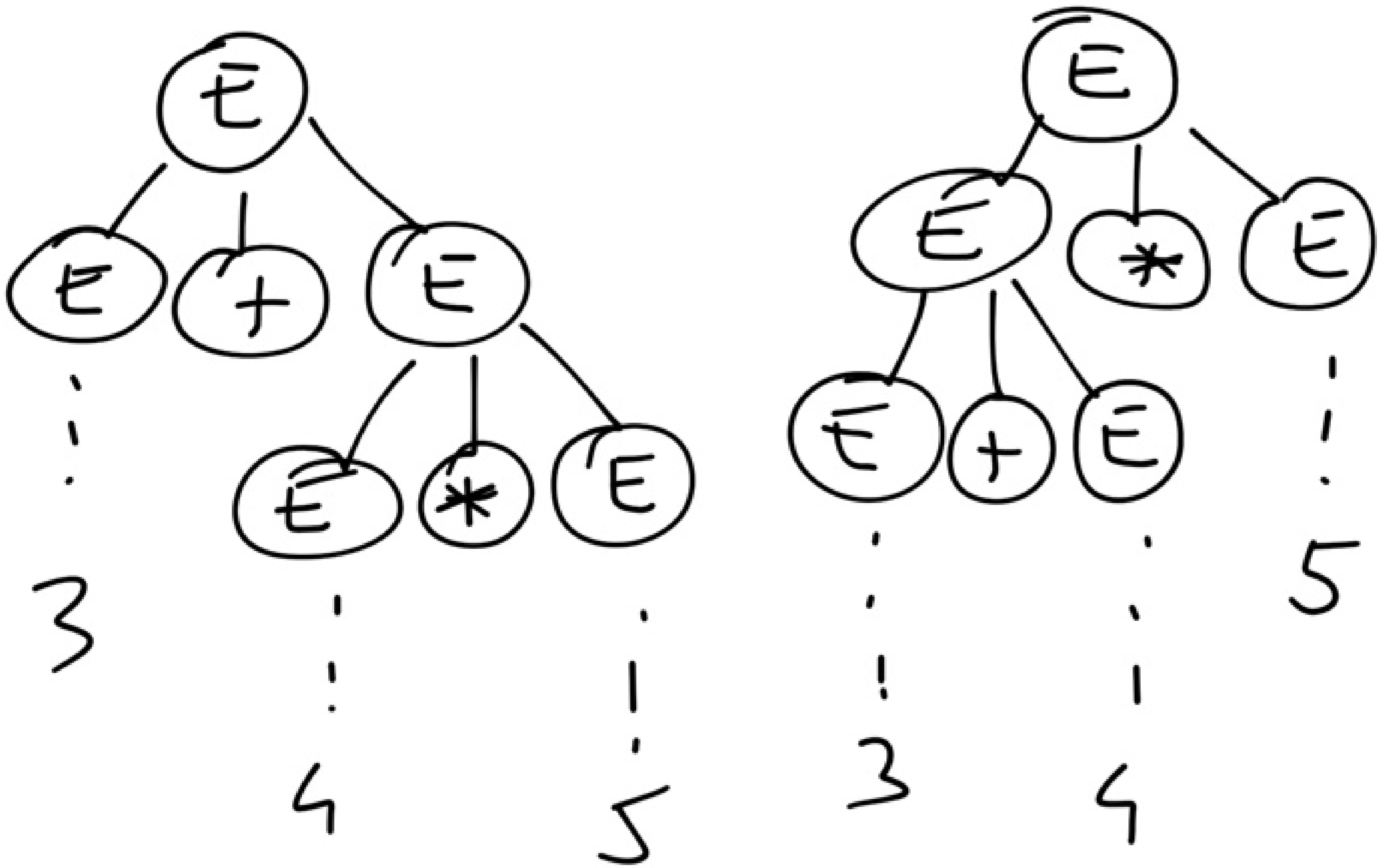
$E \to N \mid E+E \mid E*E$

$N \to \dots$

$3 + 4 * 5$



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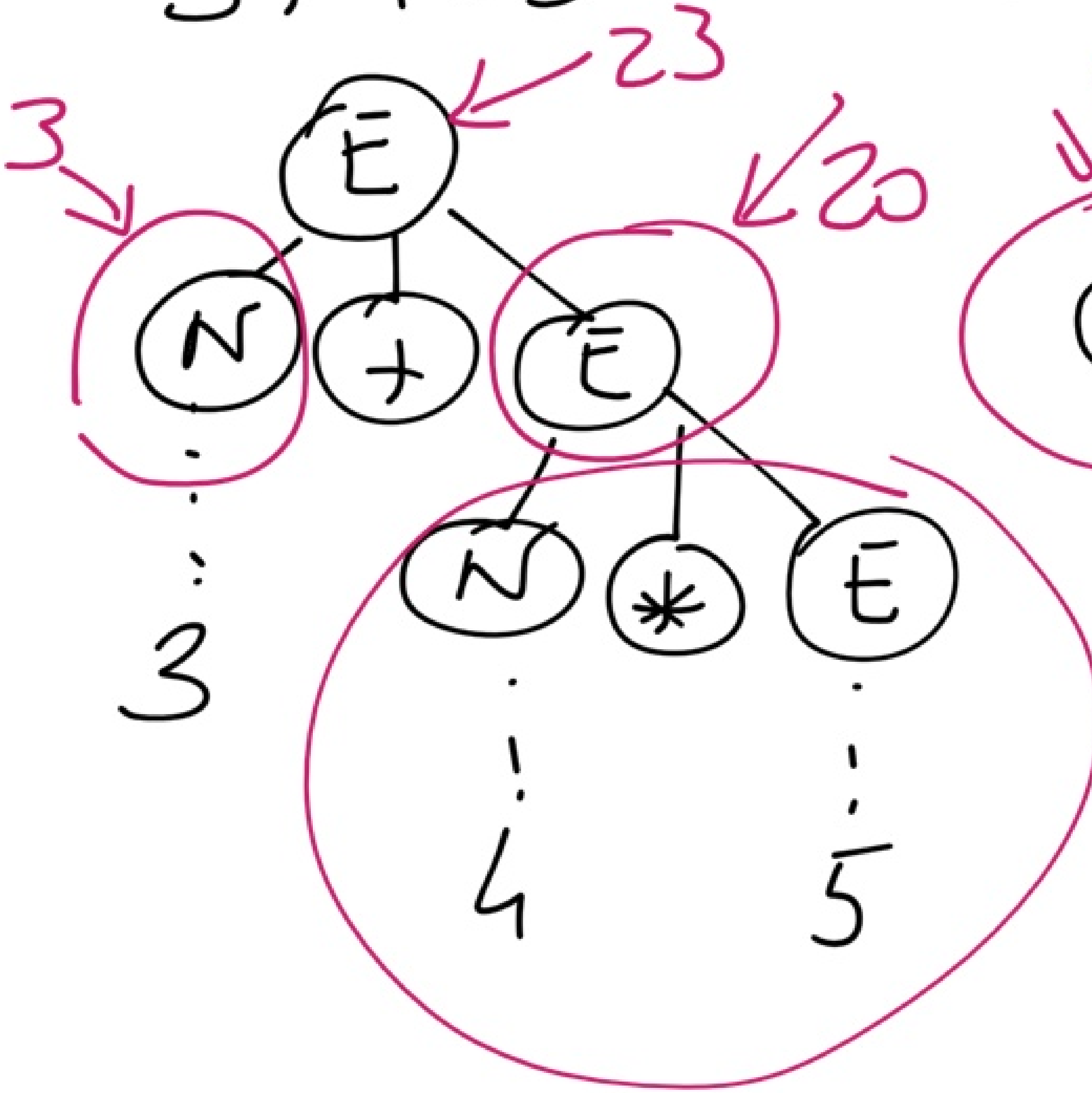
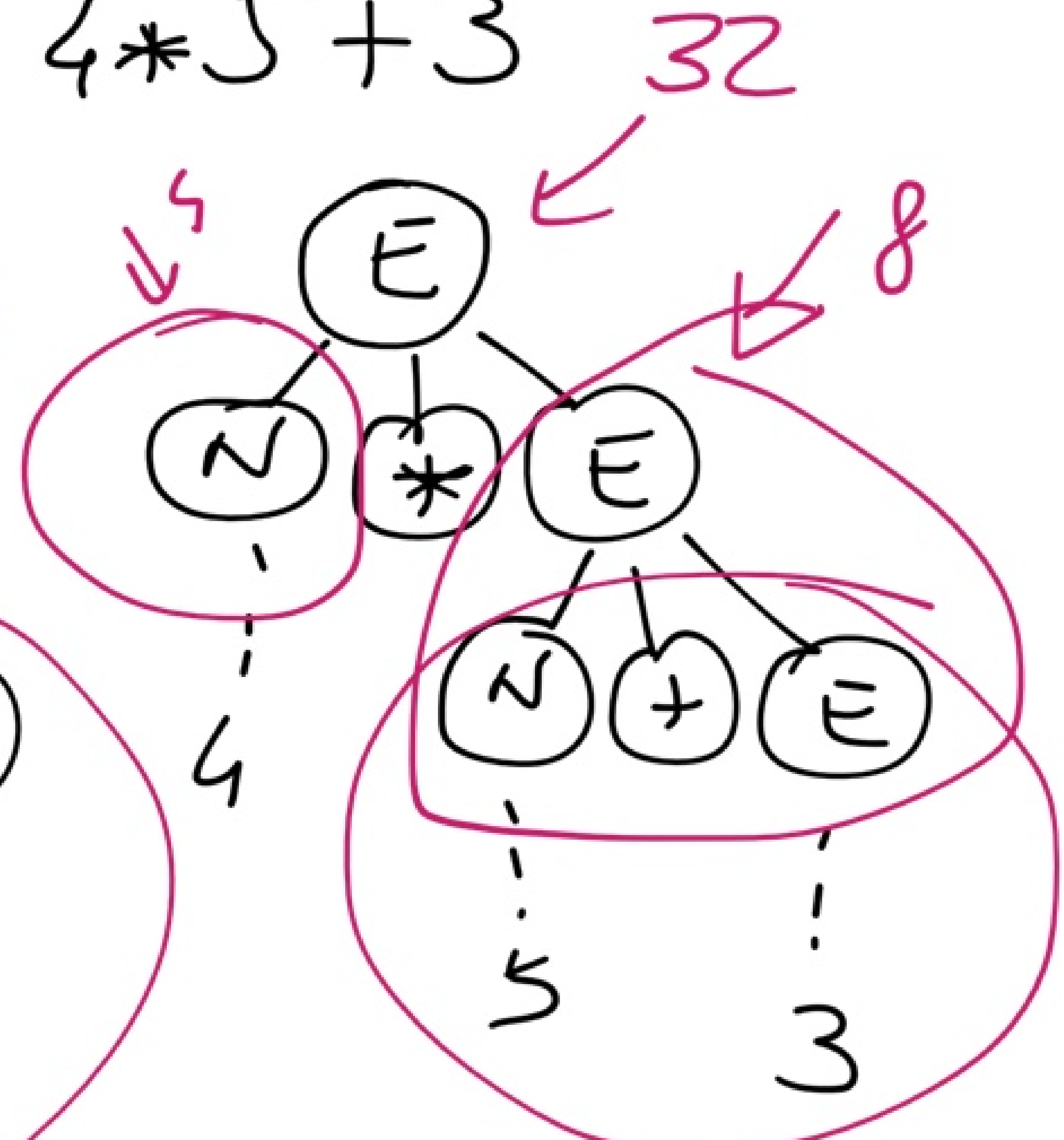
$E \to N \mid N+E \mid N*E$

$N \to \ldots$

$3+4*5$



$4*5+3$



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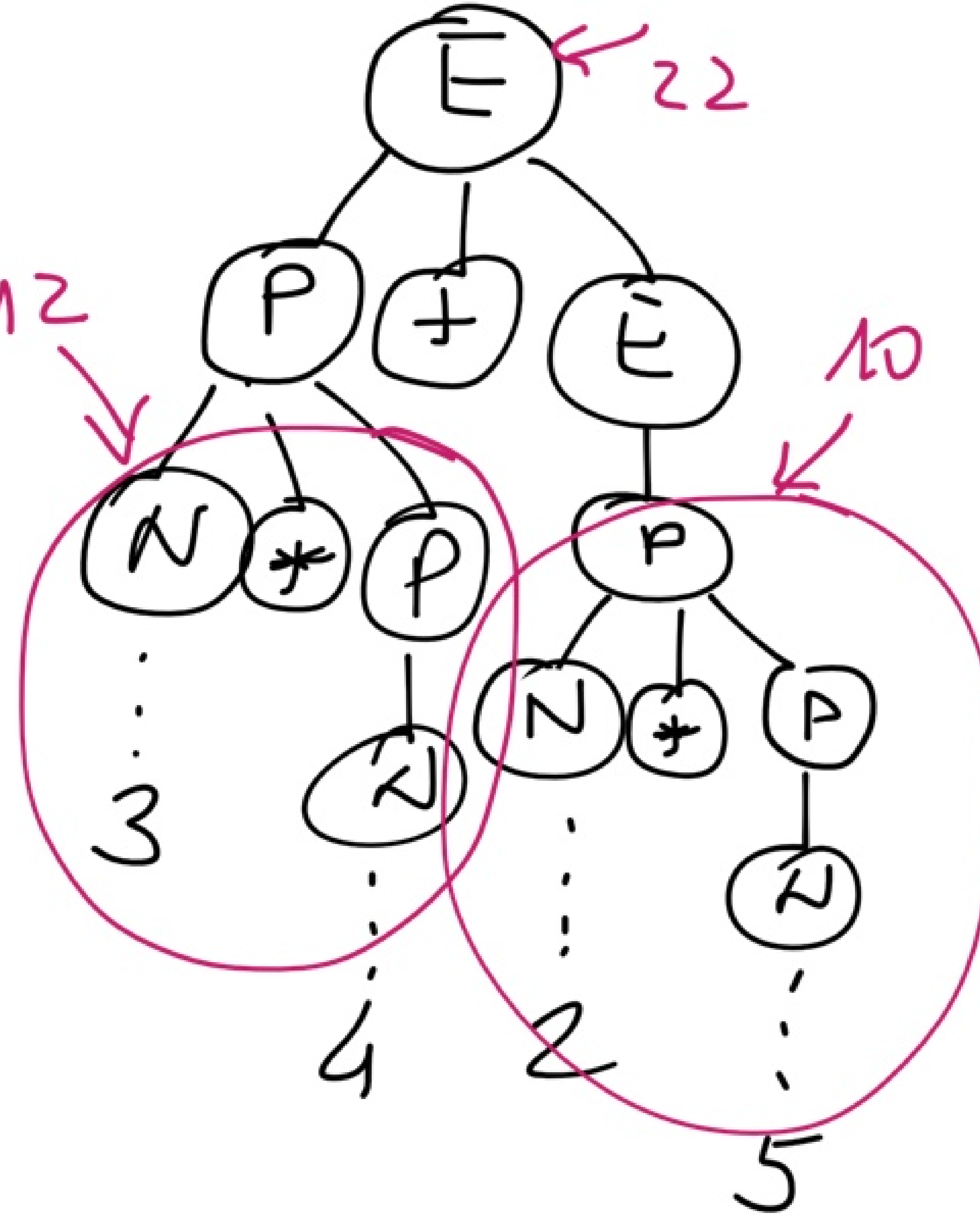
$E \rightarrow P \mid P + E$

$P \rightarrow N \mid N * P$

$N \rightarrow \dots$

$\underbrace{3*4}+\underbrace{2*5}$



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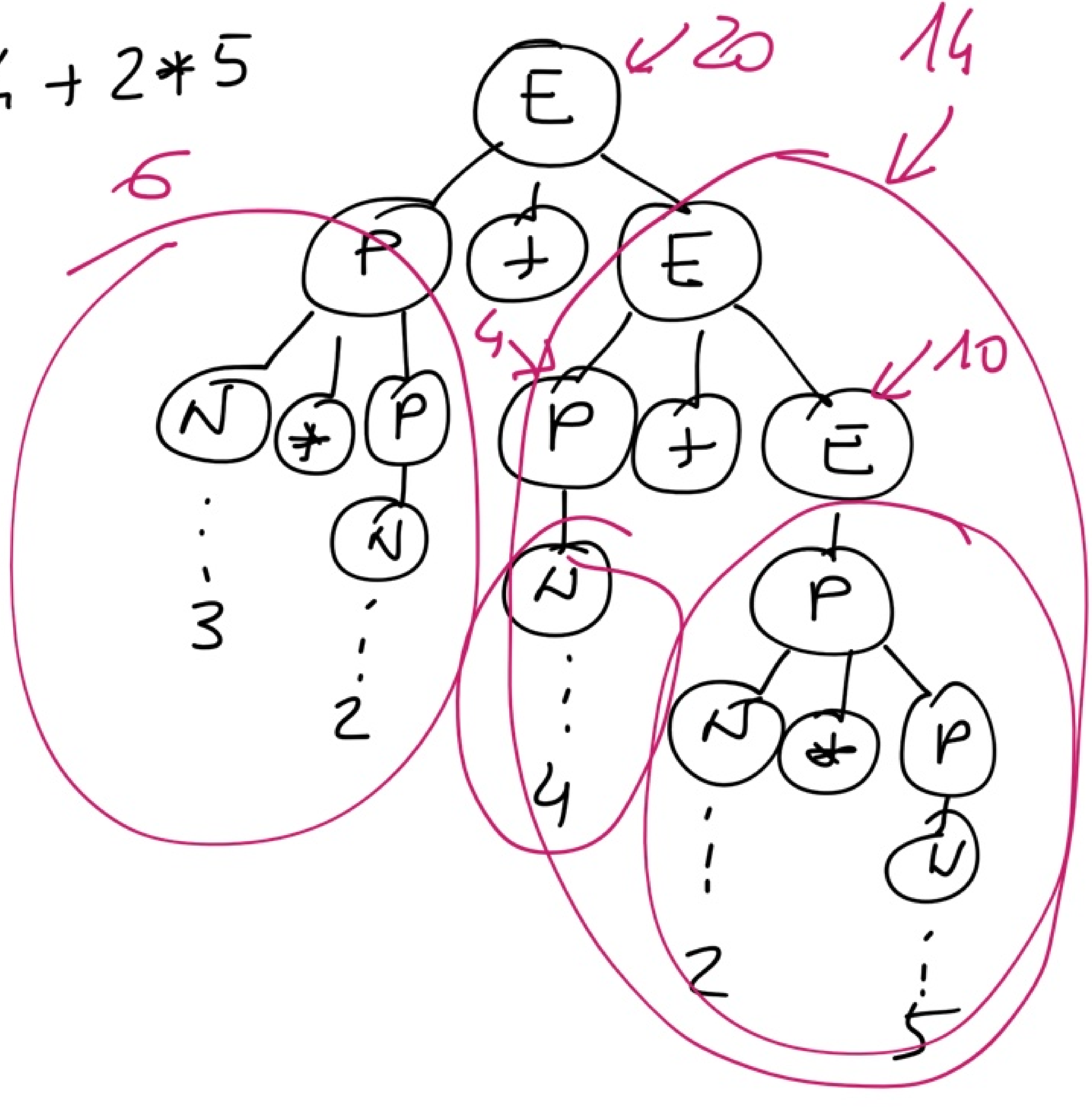
$3*2 + 4 + 2*5$



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Data una Gramm. ambigua esiste un metodo costruttivo per trovarne una equivalente non ambigua?

NO! –

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Ci sono linguaggi
che sono
<u>intrinsecamente</u>
<u>ambigui</u> :

Tutte le grammatiche
che generano linguaggi
nelle classe sono
<u>ambigue</u>

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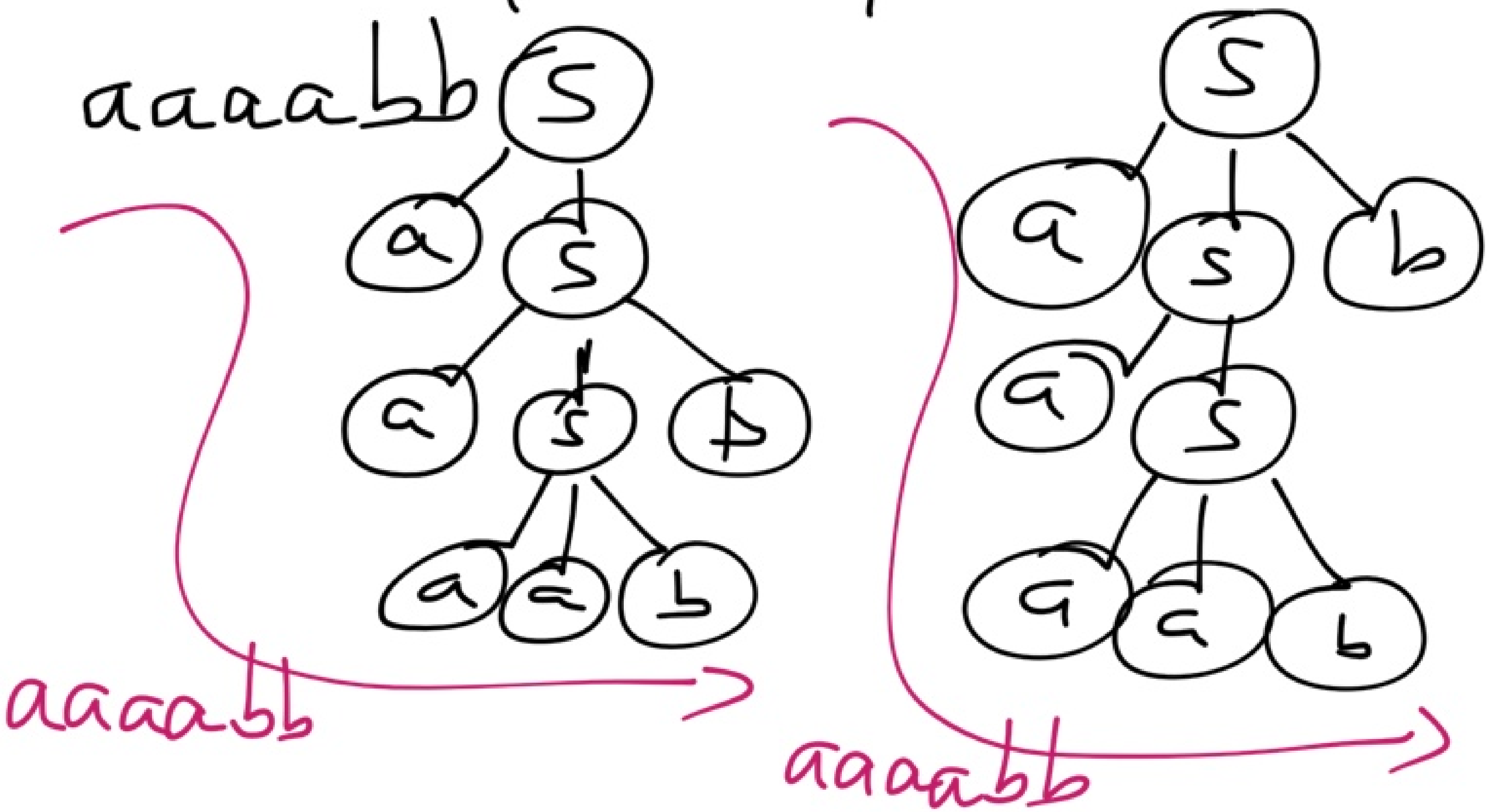
$$L = \{ a^n b^m \mid n, m > 0,\ n > m \}$$

$$S \to aab \mid aSb \mid aS$$



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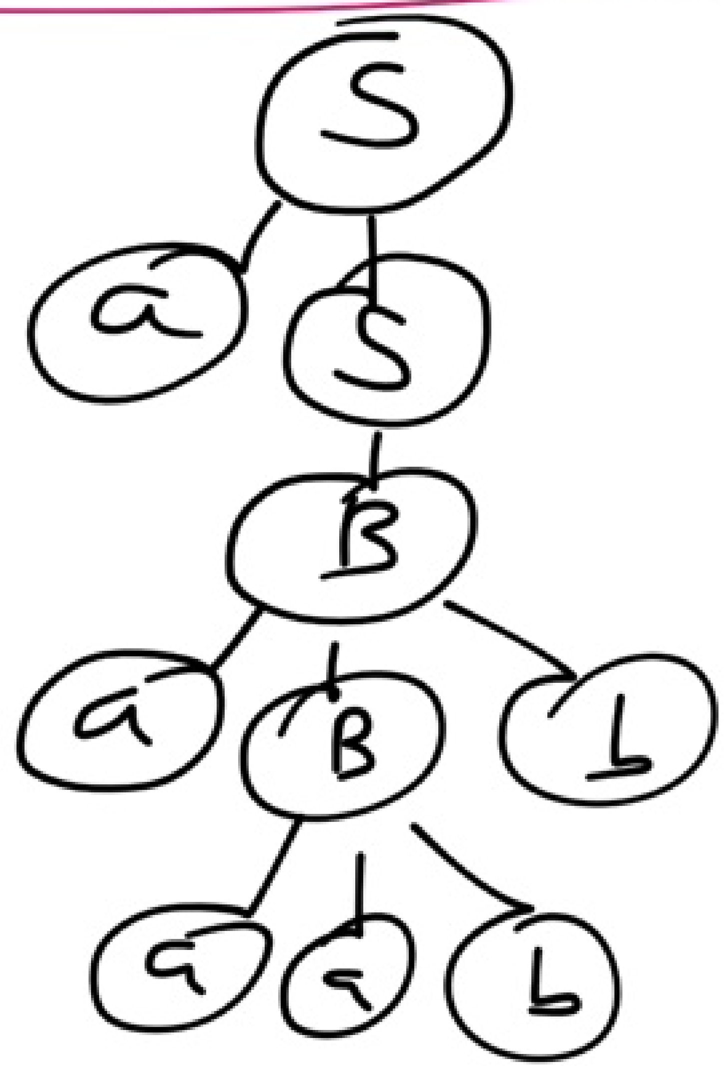
$$S \to aab \mid aSb \mid aS$$

$$S \to aS \mid B$$

$$B \to aBb \mid aab$$

aaaabb



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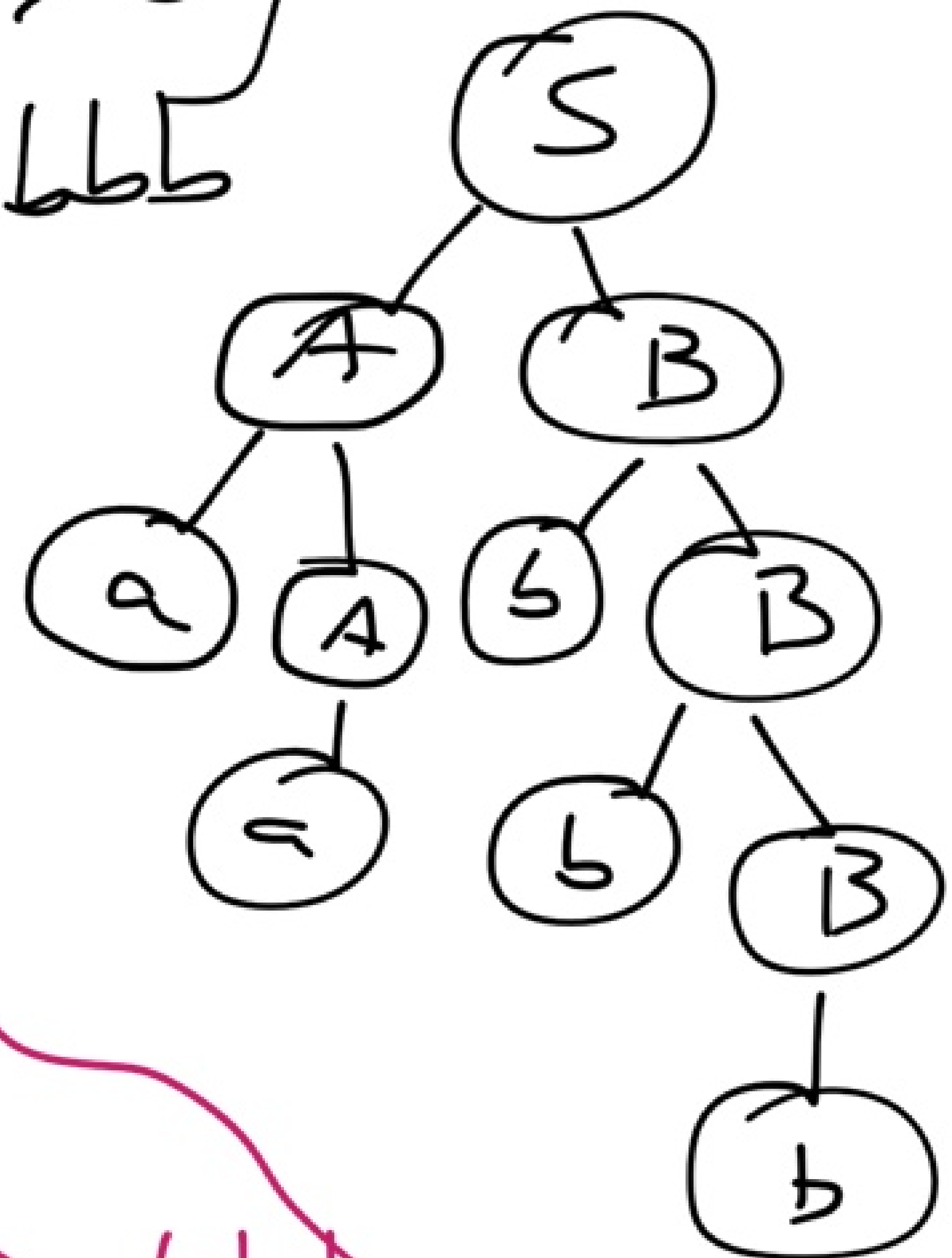
$L = \{a^n b^m \mid n, m > 0\}$

aabbb

$S \to AB$

$A \to a \mid aA$

$B \to b \mid bB$

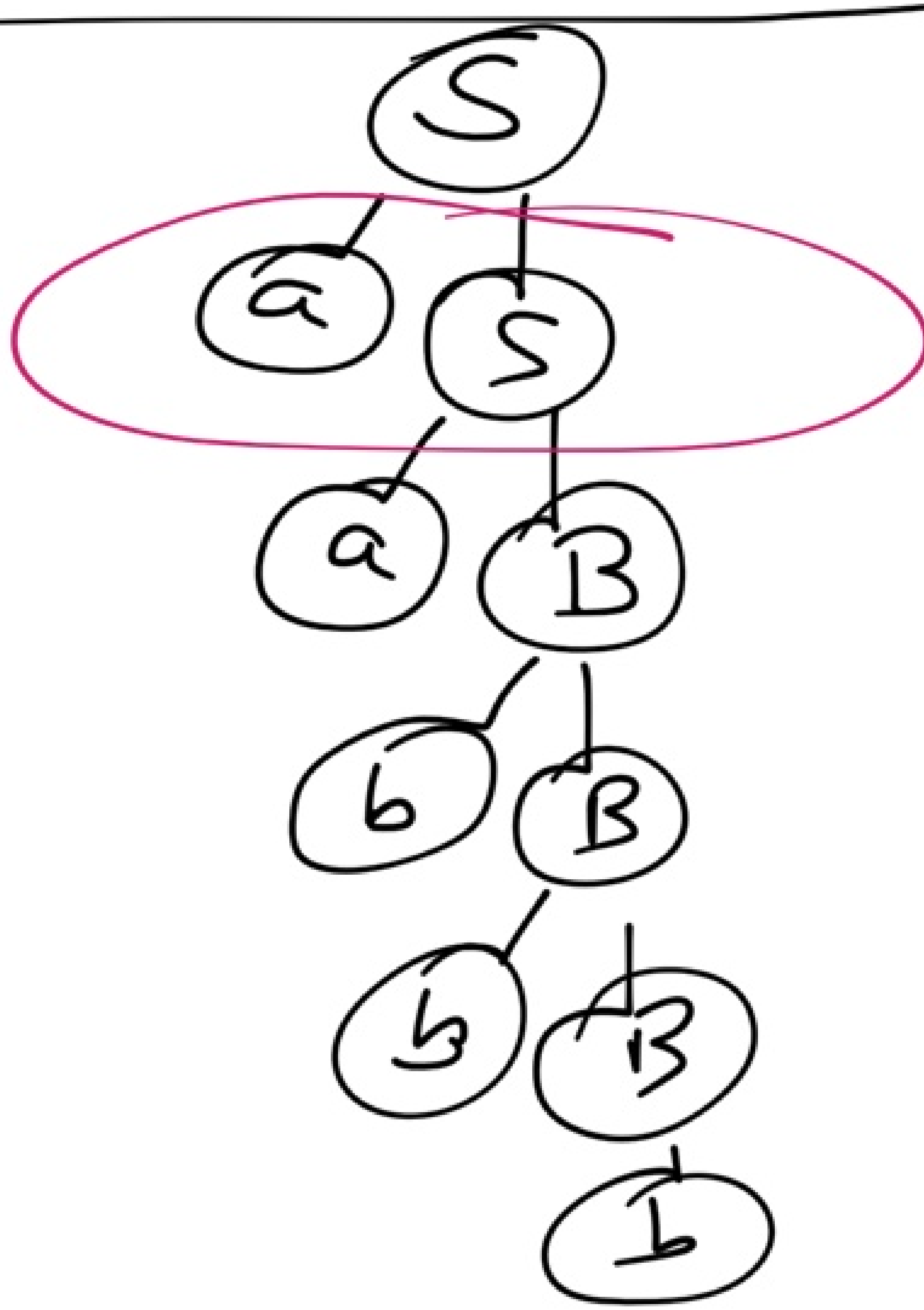


aabbb

$S \to aS \mid aB$

$B \to b \mid bB$

$\underline{aabbb}$



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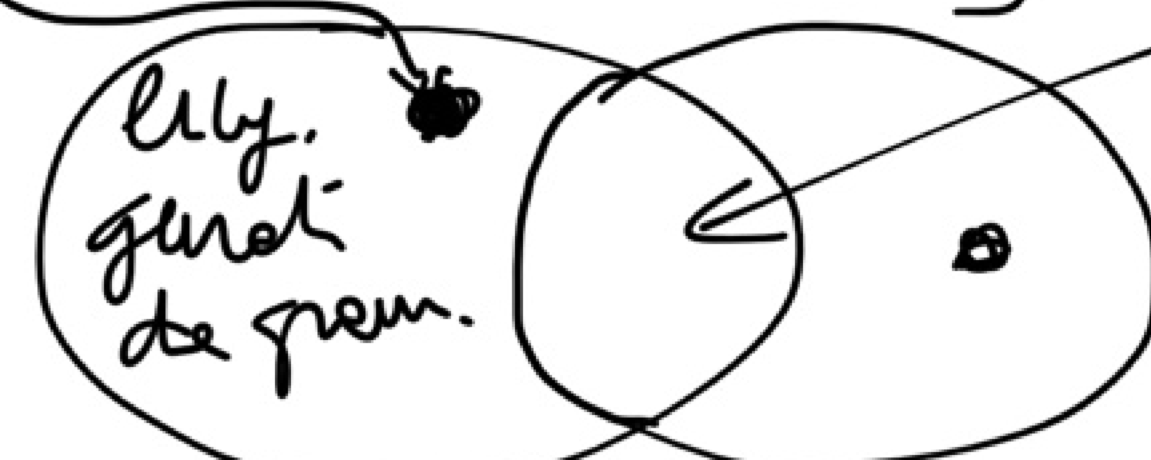
Grammatiche e automi

ASF

Grammatiche sono più potenti degli automi?

$$L = \{a^n b^n \mid n > 0\}$$

ling riconosc da ASF



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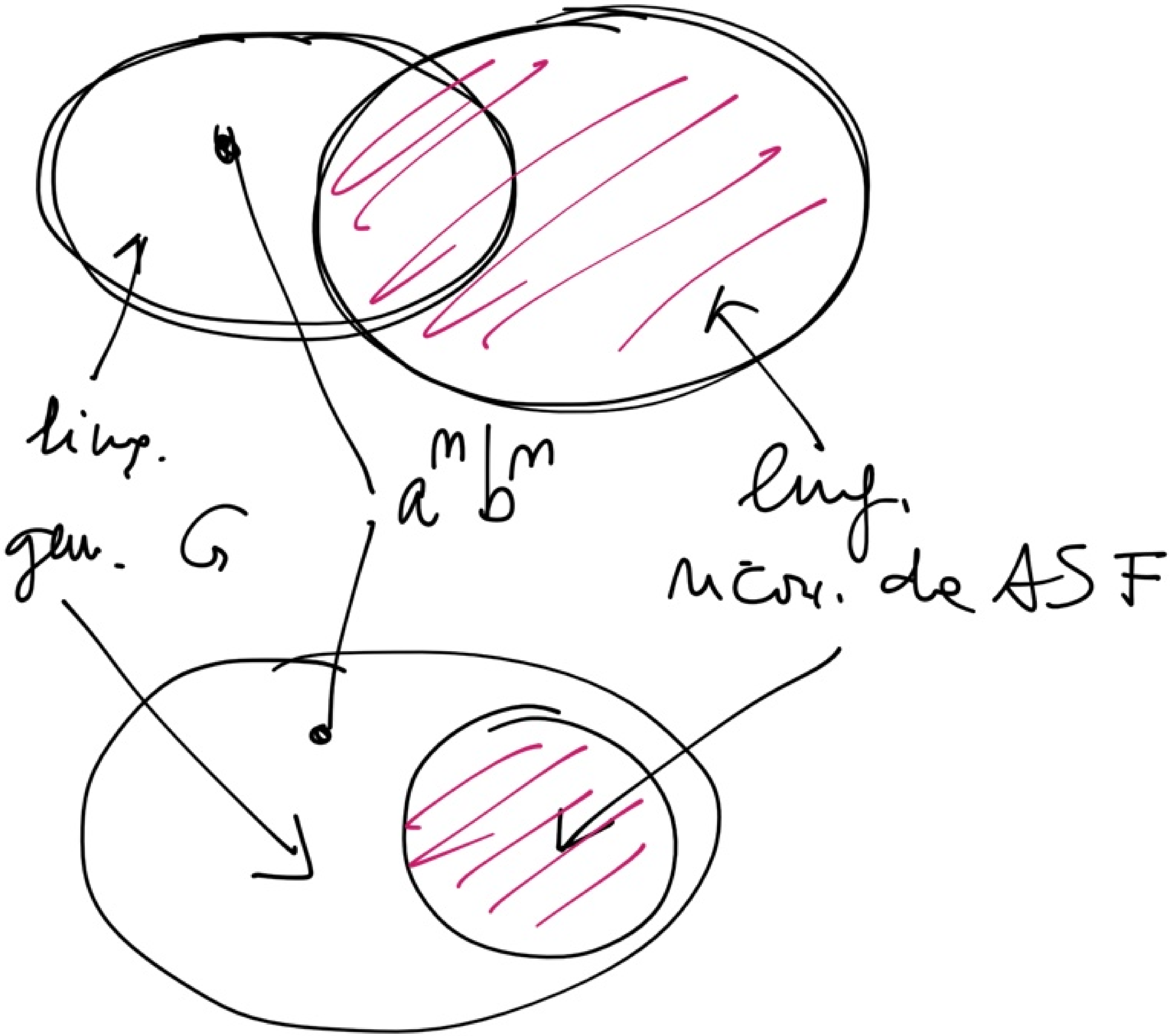

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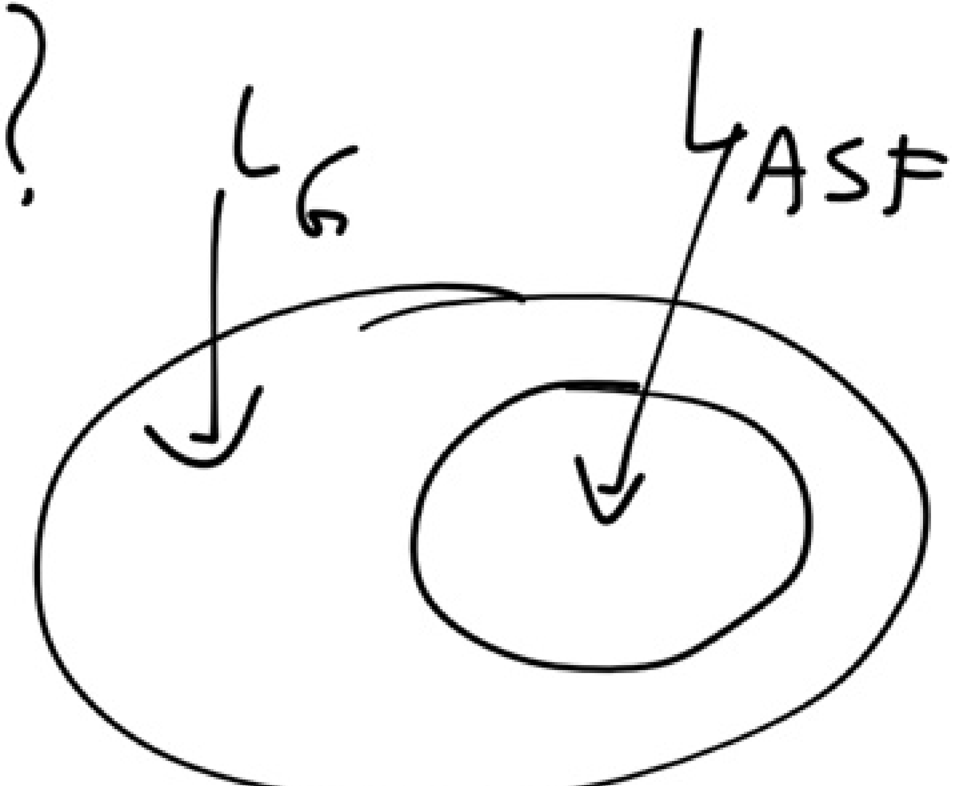
dato un automa a SF che riconosce un linguaggio L riusciamo a costruire una grammatica LC che genera lo stesso linguaggio L?

SI!



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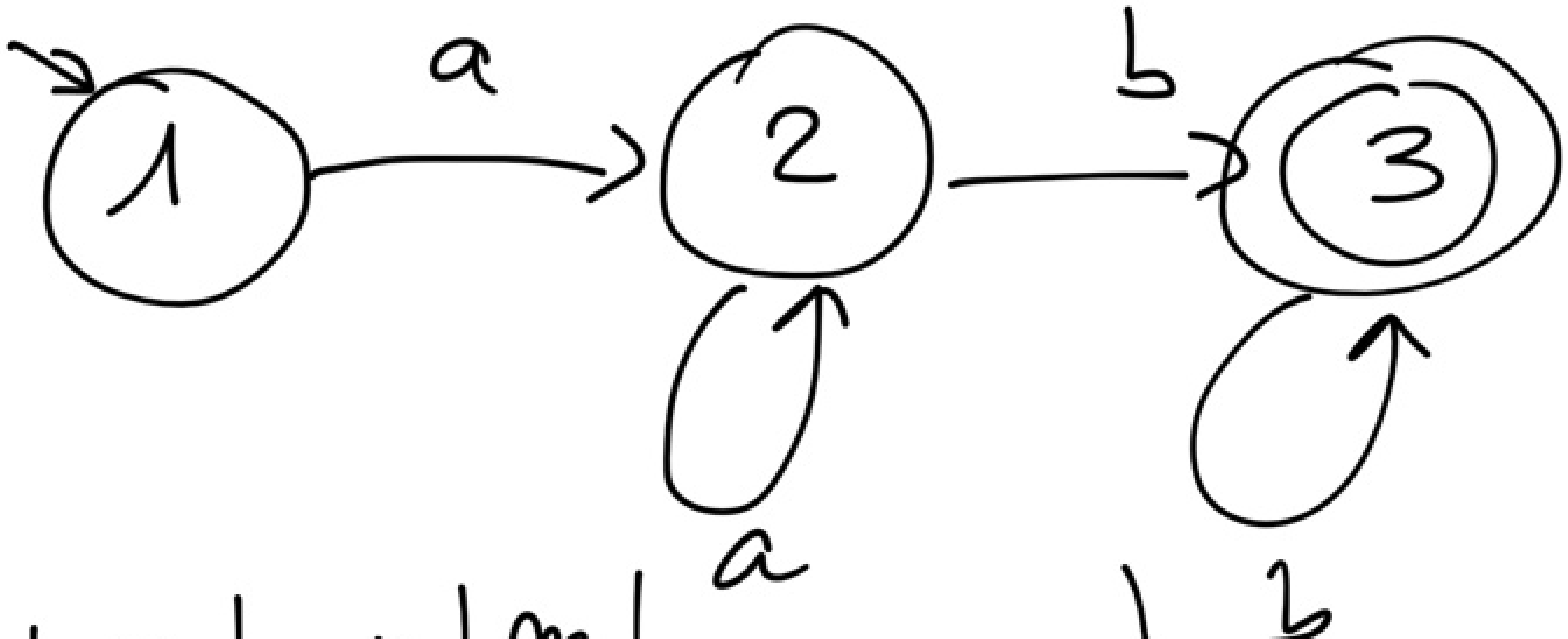
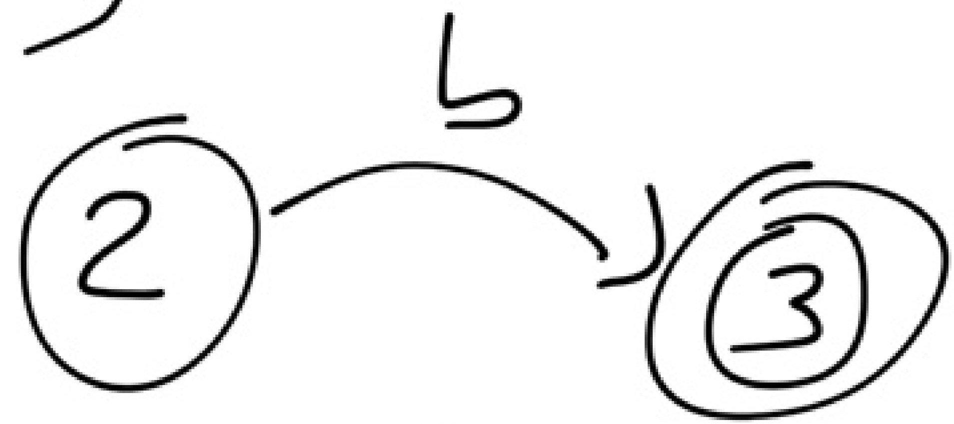


$$L = \{a^n b^m \mid n, m > 0\}$$



$1 \to a2$

$2 \to b3$

$2 \to b$

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Dato un automa SF M

- Gli stati diventano cat. sint. della grammatica
- per ogni transizione

  $\delta(S_1, a) = S_2$ in M

  si aggiunge alla grammatica la produzione $S_1 \to aS_2$
- Se S_2 è di accettazione

  si aggiunge $S_1 \to a$

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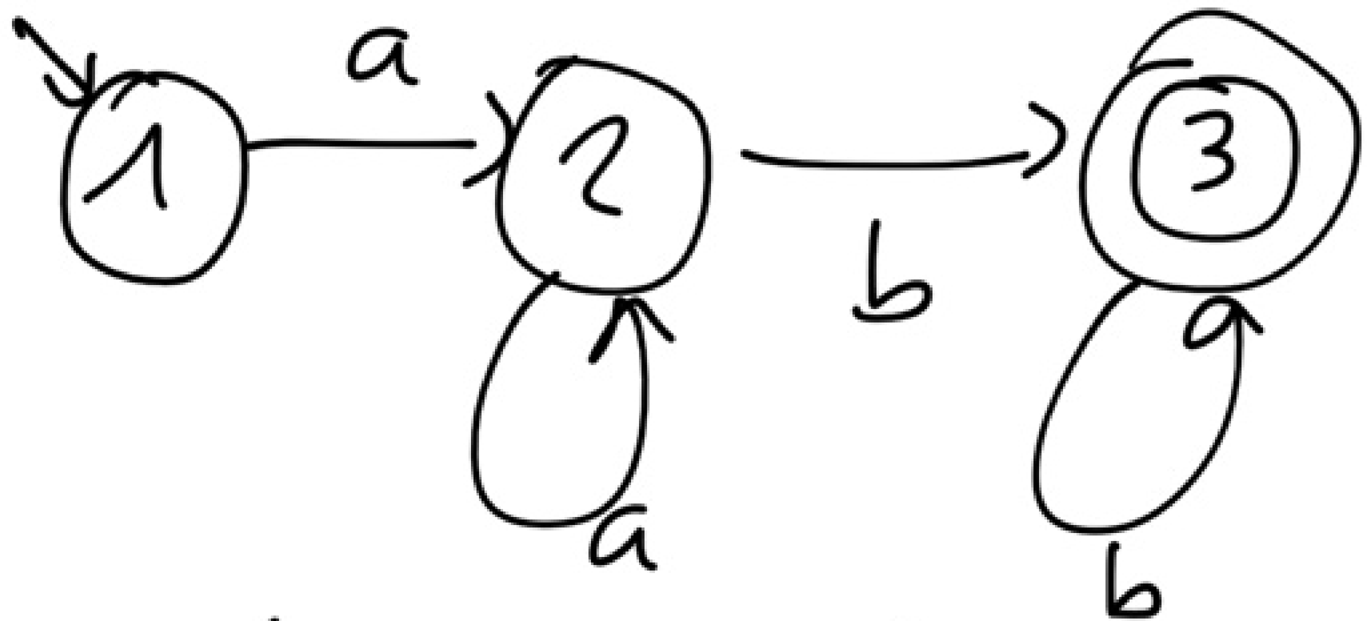

$G = (\Lambda, \{1, 2, 3\}, 1,$

$P = \{ 1 \to a2, \quad 3 \to b3,$
$2 \to a2, \quad 3 \to b \}$
$2 \to b3,$
$2 \to b,$

$A \to aB$
$B \to aB \mid bC \mid b$
$C \to b \mid bC$

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$A \to aB$

$B \to aB \mid bC \mid b$

$C \to b \mid bC$

Grammatiche regolari

$A \to a$ $\quad A \in V$, $a \in \Lambda$

$A \to aB$ $\quad A, B \in V$, $a \in \Lambda$

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I linguaggi riconosciuti da ASF sono gli stessi generati da

<u>Grammatiche regolari</u>

$$\cancel{L = \{a^n b^n \mid n > 0\}}$$

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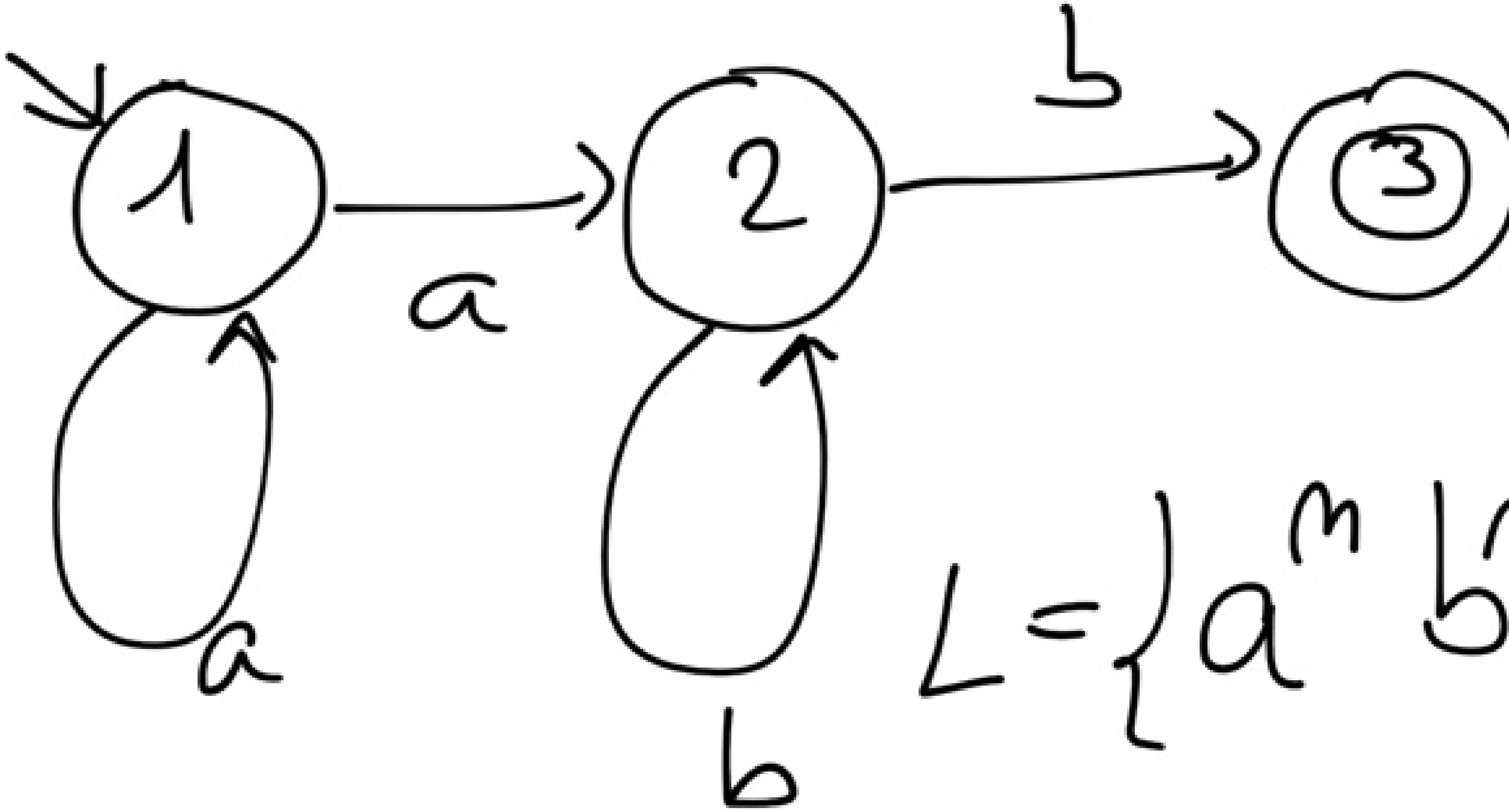

$$L = \{ a^n b^m \mid n, m > 0 \}$$

$A \to aA \mid aB$

$B \to bB \mid b$

$S \to AB$

$A \to a \mid aA$

$B \to b \mid bB$

$A = 1 \quad B = 2 \quad c = 3$

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$$E \to P \mid P + E$$

$$P \to A \mid A * P$$

$$A \to N \mid (E)$$

$$N \to \ldots$$

espressioni atomiche

$$\Lambda = \{0, 1, \ldots, 9, +, *,), (\}$$

. .

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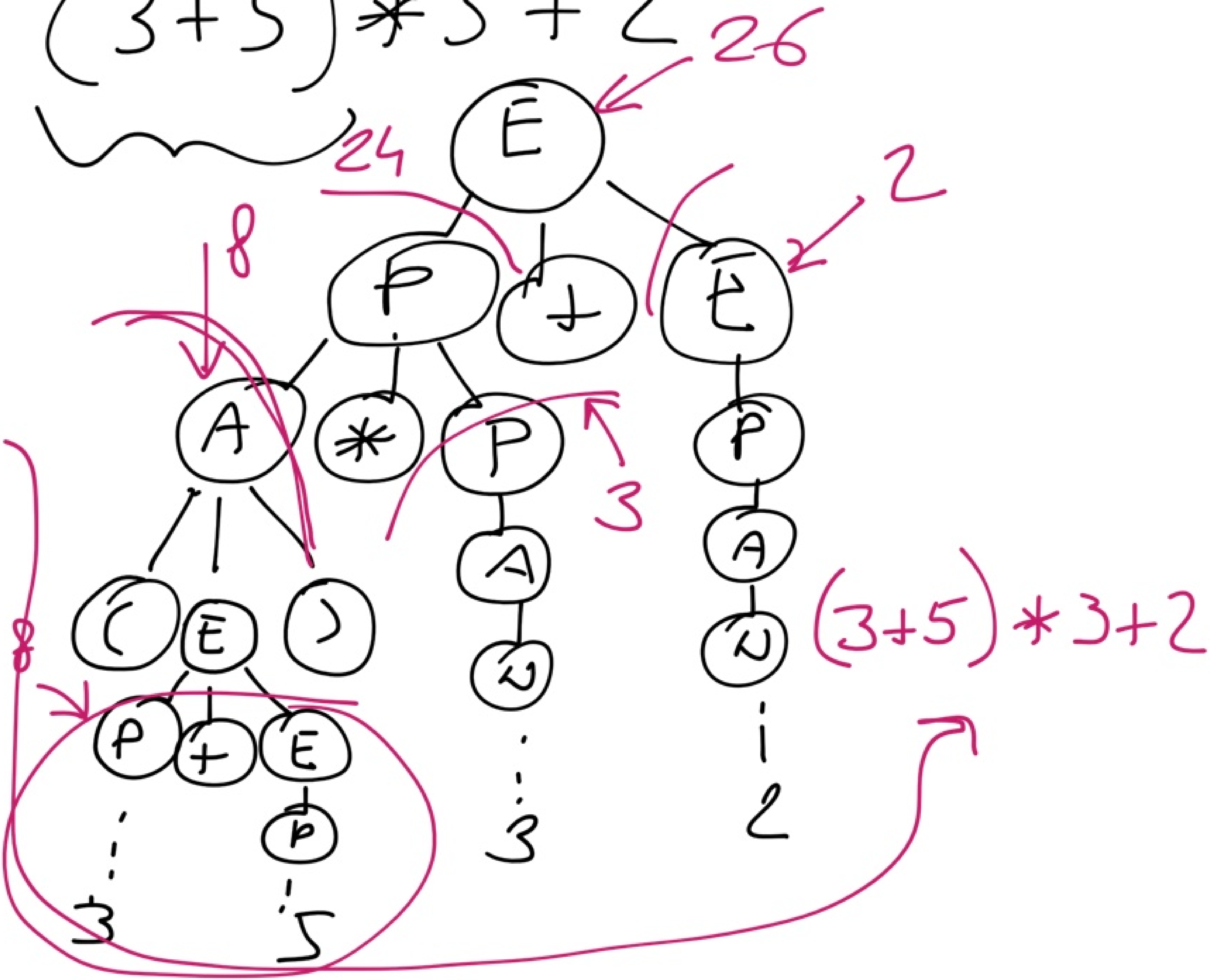
$(3+5)*3+2$



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Parentesi bilanciate

- (( ) ( ))
- Ogni parentesi aperta va chiusa
- Non si può chiudere una parentesi mai aperta

$$(((())())()())$$

$$\cancel{())}$$

$$\cancel{((())}$$

$$L = \{ (,) \}$$

$$S \to () \mid (S)$$

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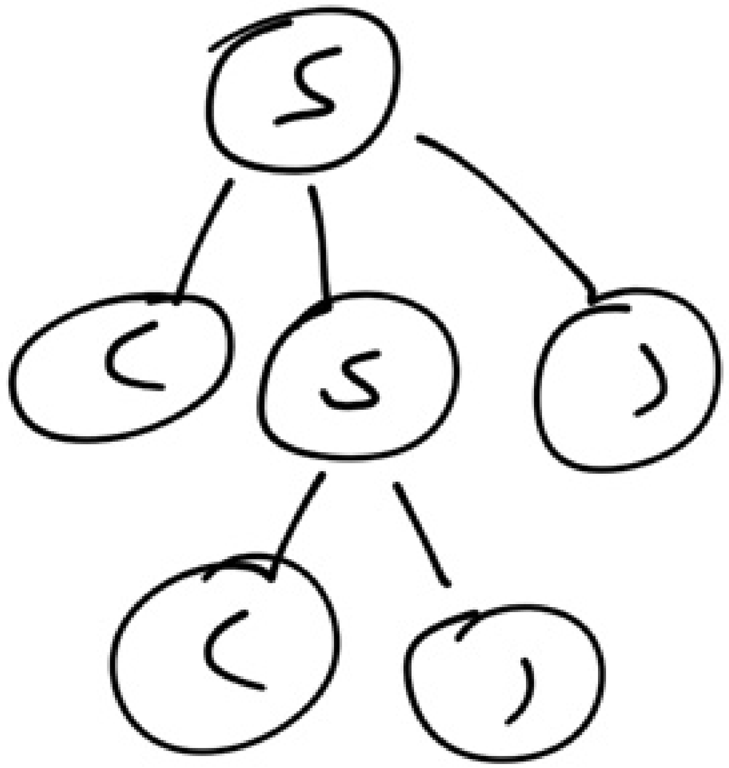
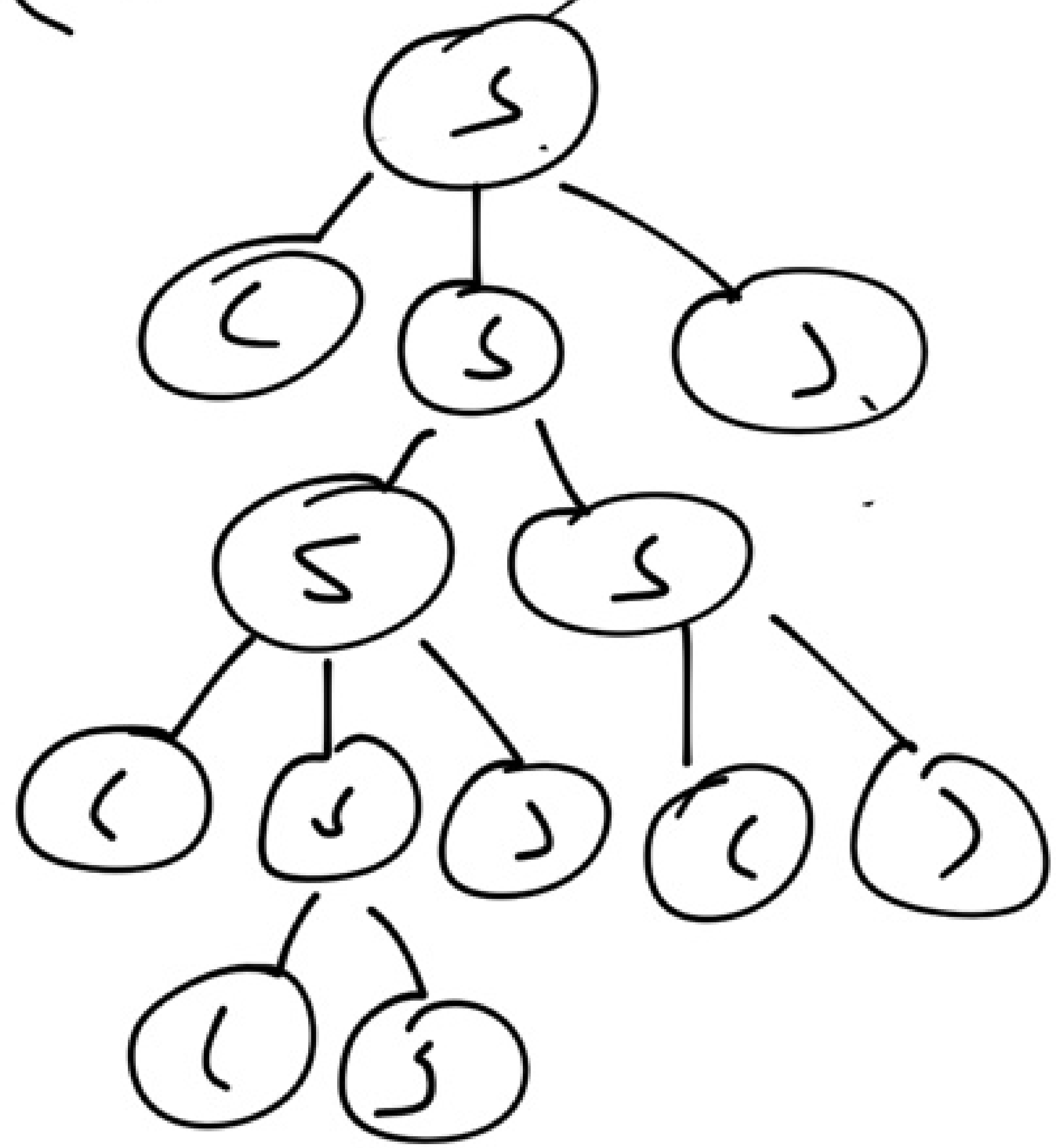
$S \to (\,) \mid (S) \mid SS$

$(())$ $\quad\quad$ $((())())$





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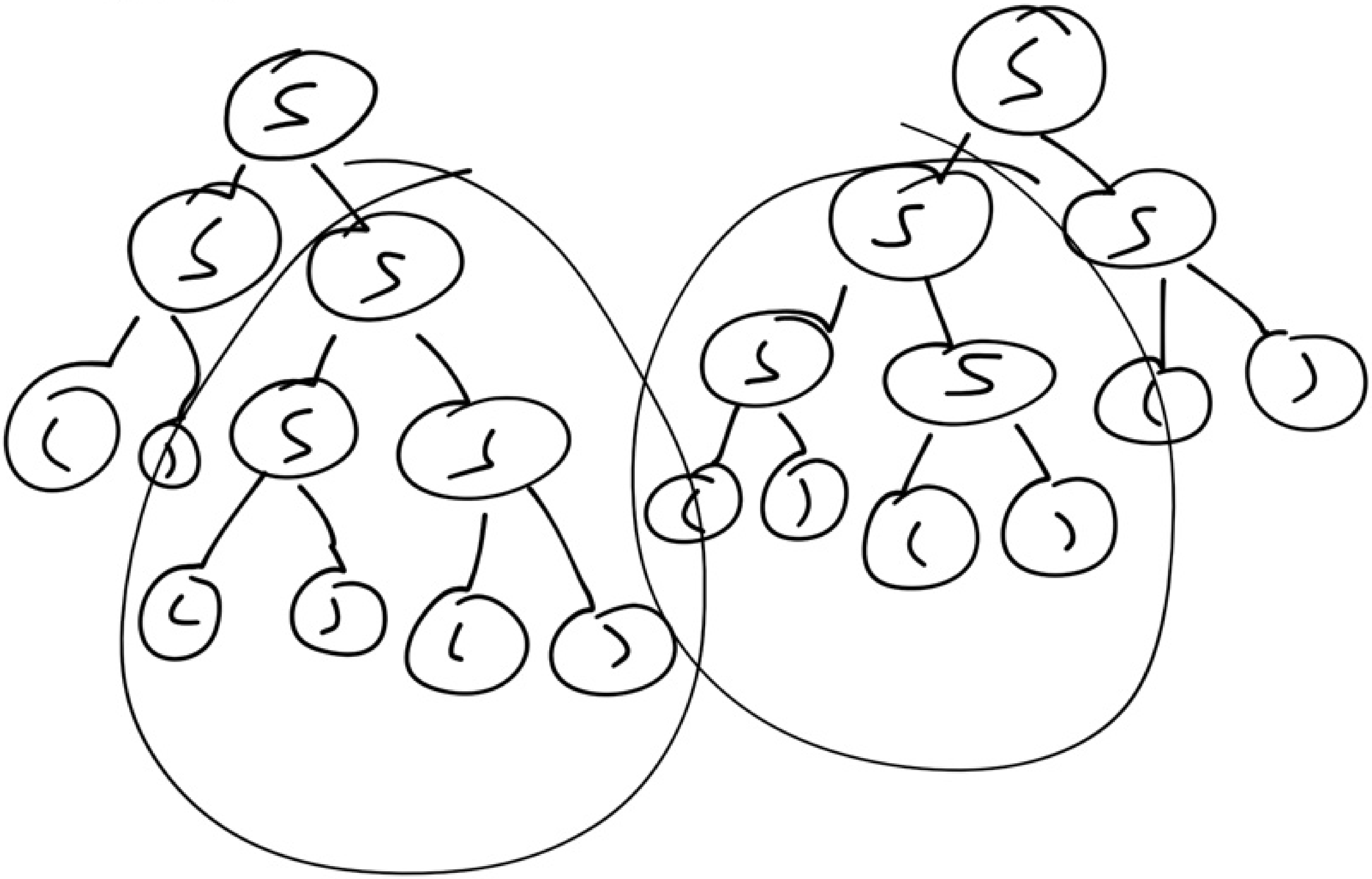
$S \to (\,) \mid (S) \mid SS$

$(\,)(\,)(\,)$



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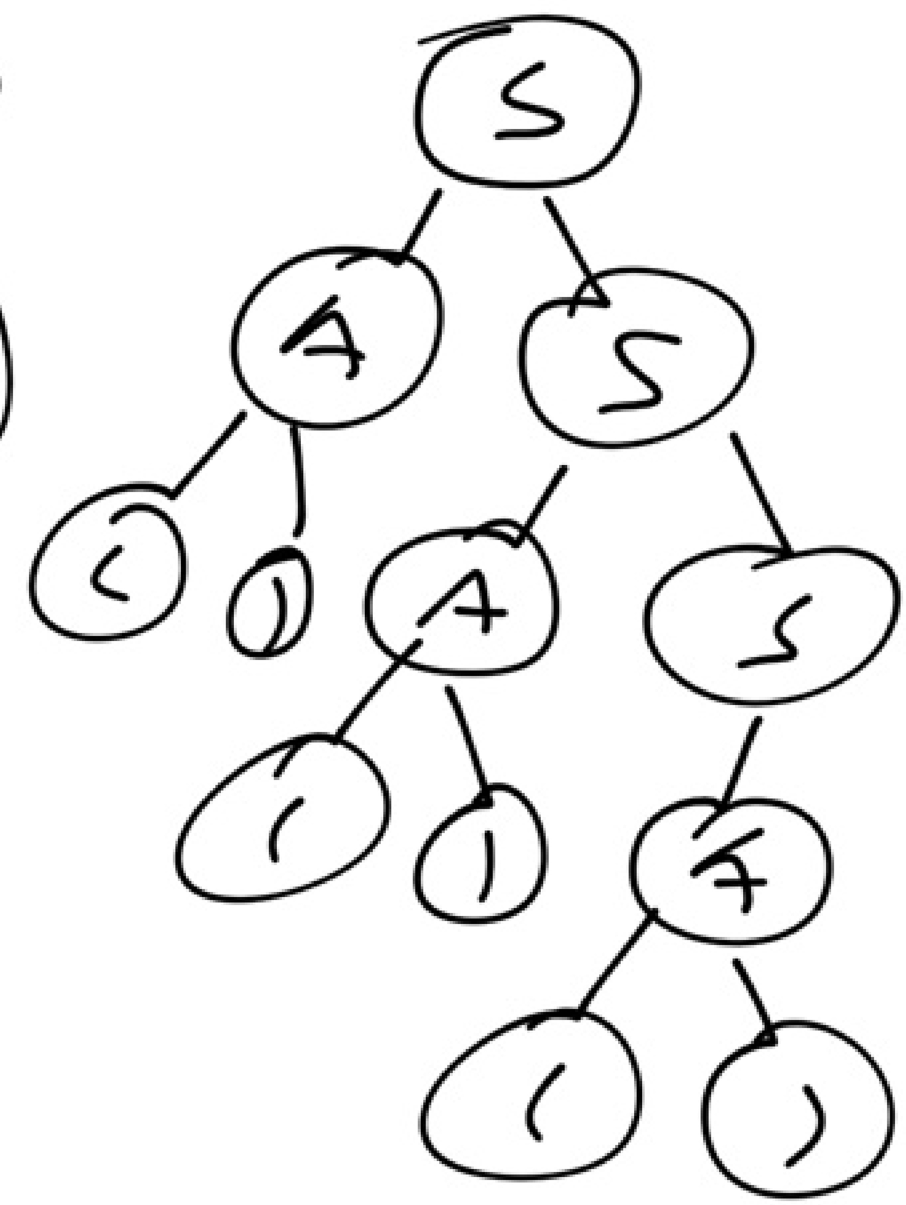
$$S \to () \mid (S) \mid SS$$

$$S \to A \mid AS$$

$$A \to () \mid (S)$$

()()()



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Linguaggi regolari

riconosciuti da ASF

generati da grammatiche regolari

PUMPING LEMMA

Se un linguaggio L è regolare allora esiste una $n \in \mathbb{N}$ tale che per tutte le stringhe di L, x, con $|x| \geq n$ valgono:

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w può essere strutturata come $w = xyz$ tali che

- $y \neq \varepsilon$
- $|xy| \leq n$
- xy^iz con $i \in \mathbb{N}$

  $\in L$

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L regolare $\exists\, n$

$|w| \geq n \qquad w = xyz$

$y \neq \varepsilon$

$|xy| \leq n$

$x y^{i} z \in L$ dove

$i = \emptyset, 1, 2 \ldots$

...

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$L = \{ a^k b^m \mid k, m > 0 \}$

$n = 4$

$\underbrace{aaa}_{x}\underbrace{a}_{y}\underbrace{bbb}_{z}$

$y \neq \varepsilon$ $\quad |xy| \leq 4$

xy^iz

$i = 0$ $aaabbb \in L$

$i = 1$ $aaaabbb \in L$

$i = 2$ $aaaaabbb \in L$

$i = 3$ $aaaaaabbb \in L$

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